# REPORT OF A CASE OF AMPUTATION THROUGH THE LEG, WITH RECOVERY, IN A MAN EIGHTY-THREE YEARS OF AGE.[1]

---

# REPORT OF A CASE OF EXPLORATORY OPERATION ON THE CERVICAL VERTEBRÆ FOR RELIEF OF PARAPLEGIA OF TRAUMATIC ORIGIN.

By ROBERT T. MORRIS, M.D.,

OF NEW YORK.

CASE I.—*Amputation through the Leg, with Recovery, in a Man, æt. 83 years and 4 months.*

In November, 1885, Dr. D. White, of Ithaca, N. Y., asked me to see the following case with him:

On account of a previous satisfactory experience in obtaining primary union in the wounds of elderly patients I decided—with some trepidation—to perform the operation described; and to stake all of the patient's chances on a scientific method of wound treatment. History—Mr. J. Van R. S., æt. 83 years and 4 months. Patient has been a strong man physically, but has been declining for many years. He has always lived well, but temperately. One year ago senile gangrene appeared over the metatarso-phalangeal articulation of the right hallux. There is no history of cause for diseased arteries, other than the history of senility. The gangrene progressed slowly until all of the toes of the right foot, with the exception of the little toe, had dropped off, and the exposed tissues showed hardly any signs of attempt at repair. Chronic cellulitis of the whole foot accompanied the gangrenous process in the toes, and persisted in spite of treatment.

Examination—Mental powers fairly well preserved. Vital organs in good condition. All arteries of the right side of the body which can be felt are extremely hard and inelastic. All arteries of the left side of the body which can be felt are soft and apparently in a normal condition. Muscles flabby. Distal extremities of the first, second, third and fourth metatarsal bones of the right foot exposed, and projecting as blackened knobs. No granulations on exposed soft tissues. Whole foot, and tissues about the ankle, much swollen. Skin of foot and ankle dusky in color.

---

[1] Read before the Surgical Section of the N. Y. Academy of Medicine, April 12, 1886.

Operation—Assisted by Drs. White, Smith, Morgan (senior), and DeLano, I proceeded to operate with observance of technical antiseptic details. Dr. Smith controlled hæmorrhage by making pressure on the femoral artery with his thumb, as I did not dare use the tourniquet or Esmarch's bandage on account of the condition of the blood vessels. The patient took ether kindly. At the junction of the lower and middle thirds of the leg short side flaps were dissected up quickly, and the bones sawn in two. The three large arteries were so calcified that the lumen of each was nearly occluded, and collateral circulation had been established through smaller arteries in the vicinity. It was necessary to crush the ends of the large arteries with strong forceps, as ligatures would not constrict them at all until this had been done. The cut blood-vessels were all ligated with No. 7 cat-gut, prepared according to Kocher's method. Only a trifling amount of blood was lost.

I am not in the habit of waiting for "glazing" to take place when using bichloride of mercury in solution as an irrigating fluid, and the flaps were were at once sutured neatly together with interrupted sutures of No. 7 catgut. No arrangement was made for drainage—with the exception of leaving out a suture at the lower angle of the wound; and care was taken to adjust skin margins closely at that point. The dressing consisted of a narrow strip of Lister protective, iodoform, and borated cotton [1].

After the operation the patient rallied promptly. There was no febrile reaction at any time afterward, and with the exception of a slightly increased pulse rate for a day or so, the vital signs remained normal. The patient "hardly missed a meal" after the operation.

The first dressing was allowed to remain untouched for fifteen days, and when at the end of that time it was removed and the wound was found to be healed by primary union "with the exception of two little points of the skin" which closed shortly afterward. There was no formation of pus at any time, and the dressing was "neat and sweet;" containing only the usual small amount of transparent lymph-like discharge which follows an antiseptic operation.

---

[1] I had neglected to take bichloride gauze or cotton with me; expecting to find these materials at Ithaca.

In a letter recently received I learn that the patient walks about with two canes and a false leg (peg-leg)—that his health is very good indeed—that he eats and sleeps well—and that to all appearances he has a new lease of life.

### Case II.—*Exploratory Operation on Cervical Vertebræ for Relief of Paraplegia of Traumatic Origin.*

Mr. Frank S., of Elizabeth, N. J. History—Patient was 27 years of age at date of injury.

On March 11, 1883, while leaping over the shoulders of a friend, in play, he fell and struck upon his head. Paraplegia resulted—with loss of sensation and of motion at nearly all points below the neck. The patient was treated shortly afterward, but accurate notes were not made by the physician who was in attendance. From the parents and from the patient I learn that cystitis, bed sores and high temperatures made trouble for several months, and that during this time the treatment was extremely varied in character. Galvanism and faradism had been employed for awakening the paralyzed portions of the body, and various means resorted to for controlling disturbances of the viscera. A portion of the skin of the right arm which is supplied by a branch of the musculo-spiral nerve retained sensation for several weeks; but sensation suddenly ceased at that point after the application of an unusually strong faradic current.

I first saw the case eleven months after the date of the injury. The patient was quite well nourished, and the bed sores had healed completely. A chronic cystitis remained. The skin of the neck and of the upper portion of the thorax was hyperæsthetic, but lower down, sensation in the skin was entirely wanting. Sharp pains occasionally ran along the course of the right sciatic nerve, and the patient complained greatly of cramping pains in the right hallux. The muscles of the head and neck were in a normal condition so far as I could discern. The biceps muscles supplied by the musculo-cutaneous nerves, and the deltoid muscles supplied by the circumflex nerves, acted by volition; but all of the muscles supplied by the lower nerves were paralyzed. The skin over the biceps, and over the larger portion of the deltoid muscles was anæsthetic. The sphincter muscles of the bladder and rectum served to retain the contents of the two viscera to a certain extent.

Electricity had been employed irregularly, and not according to any method, about the extremities; but the muscles of the extremities—excepting the intrinsic muscles of the hands and feet—were quite plump and firm. The plump muscles responded well to faradic excitation, but the atrophied muscles of the trunk refused to show contraction of their fibres.

Treatment was directed toward development of the muscles which had become atrophied. Galvanism was employed until contraction could be observed in any particular muscle or group of muscles, and then stimulation was continued with the faradic current.

The frequent exacerbations of cystitis were controlled fairly well with boric acid given internally, but some indigestion was caused by the drug. The details of the general treatment were left to the care of the parents who had studied the case well.

On account of the distance at which the patient lived from New York, I have not been able to make as many minute observations as I should otherwise have made, but points noted during the year following the time of my first examination may be summed up as follows: Skin of head, neck and upper portion of chest, of normal color. Sudoriferous glands there abnormally active.

Skin of other portions of the body is generally pale in color, and very dry, but occasionally it is reddish and moist. Hairs of skin of natural length and color. Growth of nails apparently not disturbed.

Muscles of head and neck and deltoid and biceps muscles of arms are plump and firm, contracting by volition.

Muscles of trunk and limbs in good condition, (pectorals, glutei and muscles attached to spinal column posteriorly are restored from condition of atrophy and non-contractility.

Not contracting by volition, but responsive to electric stimulus.

Muscles of thenar eminences, and the short extensors of the toes restored from condition of atrophy and non-contractility. Other muscles of hands and feet atrophied, and apparently not excitable.

Diaphragm contracting normally, but rather laboriously.

Sphincter muscles of bladder and rectum weakly contracted.

Iris contracts and expands readily, but the pupil seems to be constantly smaller than it should be with any given quantity of light.

Heart in normal physical condition, but accelerated rate of contraction on slight provocation.

Lungs expand by virtue of diaphragmatic action, so that respiration seems to be wholly abdominal.

I cannot prove that the accessory muscles of respiration are ever called into use as such in this patient.

Rate of respiration nearly normal, I think, but slight disturbance increases the number of inspirations markedly.

Stomach and intestines show no disturbances worthy of mention, as far as their part in the work of digestion is concerned. The contents of the rectum cannot be expelled by the patient, and accumulations there are washed away with a syringe at intervals of about forty-eight hours. The patient knows when the rectum should be emptied, but he cannot explain the character of the sensation.

Bladder contracted so that it will hold only three or four ounces of urine at a time. Walls of bladder corrugated, and covered with small concretions. The patient knows when his bladder is full, and a small drink of beer affects the urinary apparatus so quickly that he asks to have his bladder emptied almost immediately afterward. There is no voluntary control over the organ.

Attacks of cystitis have occurred at frequent intervals since the time of the injury to the neck.

Liver of normal size. Hepatitis(?) has occurred several times, and has caused pain and discomfort in the liver region. Stools at such times decolored.

Spleen enlarged to a decided degree. (Patient lives in a malarial region, and gives a history of malarial poisoning.)

Kidneys give evidence of chronic nephritis, but the character of the nephritis is undetermined.

Brain evidently not disturbed. Patient has shown no signs of cerebral trouble, and he is bright and intelligent in conversation.

Nerves of special sense, with exception of the optic nerve, are in a normal condition. The optic disc and the retina look natural, but the patient complains that he cannot read for any length of time without tiring his eyes.

Nerves of sensation and of motion, have been referred to elsewhere.

The sympathetic system shows little more than what has been mentioned. It may be worthy of remark, that the skin of the paralyzed body reddens in response to irritation, and during febrile states. The color appears in flecks and blotches, and gives the skin a peculiar marbled appearance.

The patient's urine is alkaline and of normal specific gravity, and it contains sometimes twenty per cent. of albumen by volume. It contains also large quantities of phosphates, pus cells, granular, epithelial, fatty, and blood casts, decomposing bladder epithelium, and swarms of bacteria.

All of the joints of the patient's extremities are in a condition of partial anchylosis, although the large joints admit of rather free passive movement in a limited range.

The spinal column shows no external sign of injury, and guided by inspection or by the sense of touch one would not know that the vertebræ had suffered any injury.

Judging from the fact that the arc of voluntary motion was complete through a portion of the brachial plexus, and judging from the character of the reflexes below that point, I made a diagnosis of fracture of the body of the sixth cervical vertebra with crushing of a corresponding section of spinal cord. I believed that with the exception of ascending and descending degeneration of the lateral columns the cord remained in good condition, and that it served in its function as a centre of reflection.

Whether or not any re-communication could be established between the cord and the brain—if a narrow crushed portion of cord were exsected, and the good ends sutured together—was a question which had never been answered.

Believing that my wound would heal by primary union I thought it worth while to make an attempt to exsect the damaged portion of the cord—(removing one or two of the cervical vertebræ if necessary.)

Regeneration of degenerated lateral columns if not to be expected was at least thought to be possible.

The patient was promised nothing. He and his parents considering the case as a whole agreed that an operation, though wholly experimental, was worth the undertaking. Imagine yourself in the patient's place—a living head—a dead body.

On June 12th, 1885, assisted by Drs. F. C. Fuller, Wm. B. Clark, C. L. Bagg and O. Abruzzo of New York, I proceeded to operate. Scientific antiseptic precautions were observed.

The first incision extended along the tips of the spinous processes from the fourth cervical to the fourth dorsal vertebra, and the scalpel was then carried down to the laminæ on either side, and the muscular and ligamentous tissues cut through in a line parallel to the row of spinous processes.

I had found on rehearsing the operation at the dead house that this very large wound was needed in order to obtain room for further work.

Strong retractors held the muscular tissues aside, and with a raspatory the periosteum was separated from the laminæ of the seventh cervical vertebra.

Other operators have found difficulty in using Hey's saw, but it seemed to be just the thing in this particular case; and with a little aid from cutting forceps I found no difficulty in removing the laminæ and spinous process of this vertebra. The spinous process of the sixth cervical vertebra was next removed, and sufficient room given for examination.

The membranes of the cord were found to be united in one dense fibrous mass and firmly attached to the bony tissues in the vicinity. On cutting through the tense and bulging membranes a very large quantity of clear, yellowish cephalo-rachidian fluid escaped.

The spinal cord was flattened and hardly thicker than a sheet of ordinary blotting paper. It was dull reddish gray in color, and fibrous in texture. A very few glistening healthy fibres were to be seen, and these fibres stood out in pretty contrast, like a new spider's web along a decaying twig.

The posterior surfaces of the bodies of the sixth and seventh cervical vertebræ seemed to be of normal height and breadth, but felt irregular through the thickened membranes. The right lamina of the seventh vertebra was thickened at one point so that it encroached upon the spinal canal.

As far as examination with the probe could be made,[1] the spinal cord was found to be degenerated, and it is a question whether the cord below the point of injury has not degenerated in its entirety and given its business over to the care of the sympathetic system.

Probably at the time of the accident the bodies of the sixth and seventh cervical vertebræ were either crushed or torn apart, the laminæ or transverse processes or articular processes fractured, and the cord contused at a point opposite the bodies of the vertebræ. Reposition of fragments of bone followed; but the cord cut off from communication with the brain rapidly fell into a condition of atrophy.

My wound was closed with cat-gut prepared according to Kocher's method, after complete hæmostasis had been obtained in the wound with the same material. Two or three strands of silk worm gut were used to relieve tension at the line of sutures, and two decalcified bone drainage tubes were employed.

The patient rallied quickly from the operation, but nephritis and cystitis made him uncomfortable for several days. The antiseptic dressing which I had applied was not touched until two weeks after the operation. At that time it was found that with the exception of the lower drainage tube sinus the wound had healed by primary union without the formation of a single drop of pus. The drainage tubes and cat-gut had been completely absorbed. The small drainage tube opening filled with granulations and closed slowly afterward.

---

[1] The extent of the injury was so great that exsection was out of the question.

The history of the case after the operation is briefly as follows: On the day after the operation the patient appreciated the sensation of heat when hot bottles were placed at his feet, and at various times afterward this peculiar burning sensation appeared when the bottles were not in use.

The sciatic pains and cramping pains of the right hallux[1] slowly increased in frequency and at the time of present writing cause so much trouble that the patient has asked me to exsect a portion of the sciatic nerve.

About one month after the operation the patient complained of pains running down the arms to the hands, and at about the same date a new reflex was noticed—contraction of the psoas and iliacus and adductor muscles of the right leg, whenever the bowels were washed out.

The use of electricity was gradually abandoned in the case, and since then the paralyzed muscles which were plump have become lax, and the deltoid and biceps muscles contract very feebly by volition. Bed sores have again appeared over the sacrum, and they show no attempt at repair. The patient is mentally as bright as ever.

Death took place April 14, 1886.[2]

An autopsy was made on Friday, April 16, from 2 to 5:30 p. m. about forty-five hours after death. The examination was conducted by Dr. J. S. Thacher of the Pathological Laboratory of the New York Polyclinic, by whom the following report is furnished:

Report of Autopsy.—The body was extremely emaciated. There was a large bed-sore over the sacrum, and there were smaller ones on the heels, the back of the knees, and over the angles of some of the ribs. The back of the trunk was red from the post-mortem settling of the blood, but of a lighter hue than is usual.

The heart was of a pale color, but of normal size. The papillary muscles and columnæ carneæ were mottled with pale yellow. The mitral valve was a little thickened, but not rough or rigid, and the orifice was of normal size. The other valves were normal. There were a few atheromatous spots in the first part of the arch of the aorta, and in the abdominal aorta.

The lungs were very pale and very dry, the bronchi contained some muco-pus.

The liver was of normal size, pale and soft.

The spleen was of about twice the normal size, and very soft.

The stomach and intestines were not opened. Nothing abnormal was to be seen on their outer surfaces.

[1] Probably of central origin, and not to be relieved by operation.

[2] Several weeks after the above history was written.

The left kidney was normal in size. The capsule was slightly adherent. The surface of the kidney was smooth, with the exception of several dark colored depressions of a cicatricial appearance. These spots were seen on section to be pyramidal, their bases at the surface. In the other part of the cortex the markings were not distinct. The pelvis of the kidney was slightly enlarged, and contained, besides a little thin purulent fluid, a number of gritty particles, a few small calculi and one large one of the size of a large bean. The ureter was somewhat dilated.

The right kidney was a half larger than the left, the capsule slightly adherent, the surface smooth. On the surface were seen several yellow spots, from the size of a pea to that of a chestnut. These were found on section to be filled with pus. Some of the smaller pockets of pus were dilated calices; some were abscesses of the renal tissue comnicating with the pelvis, There were some yellow spots which had not broken down. There were also yellow streaks running from the pelvis to the surface of the kidney. In the pus, with which the pelvis was dilated, were many small calculi, and one of the size of a large bean, conical in shape, the smaller end lying in the beginning of the ureter. The ureter was slightly enlarged.

The bladder contained a little muco-pus, a few minute calculi, and one stone of the size of a hickory nut, but flattened.

The brain and its meninges appeared to be normal.

On examination of the spinal column, the spinous processes of the sixth and seventh cervical vertebræ were found to be absent. The laminæ of the seventh were also absent, their place being taken by firm fibrous tissue.

To this fibrous tissue and to the bony parts of the canal in the immediate neighborhood, the membranes of the cord were firmly adherent. After removing the cord there was found to be a slight dislocation forwards of one of the vertebral bodies. The membranes of the cord were at this point thick and firm, adherent to each other, and to the vertebræ. The cord itself was, however, for an inch or two of its length, broken down into a creamy fluid.[1] Above and below, the cord was firm, the lower part of the cord seeming to be harder than normal. Above the softened part, the columns of Goll were distinctly gray, and below, a portion of each lateral column was gray.

The vertebræ, from the neighborhood of the injury, and the cord were preserved for further examination.

---

[1] Compare with condition at date of operation.